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Light vehicles – Regulations Nos. 68 (Measurement of the maximum speed, including electric vehicles), 83 (Emissions of M_1 and N_1 vehicles), 101 (CO_2 emissions/fuel consumption) and 103 (Replacement pollution control devices)

Proposal for a new Supplement to the 06 and 07 series of amendments to Regulation No. 83 (Emissions of M_1 and N_1 vehicles)

Submitted by the expert from the International Organization of Motor Vehicle Manufacturers*

The text reproduced below was prepared by the expert from the International Organization of Motor Vehicle Manufacturers (OICA) to adapt the provisions of the 06 and 07 series of amendments to Regulation No. 83 on Selective Catalytic Reduction (SCR) warning and inducement systems to current vehicles, emissions requirements and reagent infrastructure. ECE/TRANS/WP.29/GRPE/2017/5 was prepared for the seventy-fourth session of the Working Party on Pollution and Energy (GRPE) but it was withdrawn to allow discussion within the European Union. This document reflects the conclusion of those discussions but due to the extent of the modifications is submitted as a new official document. The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2014–2018 (ECE/TRANS/240, para. 105 and ECE/TRANS/2014/26, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

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I. Proposal

Appendix 6,

Insert new paragraphs 1.1. and 1.2., to read:

"**1.1.** **The capacity of the reagent tank shall be such that a full tank does not need to be replenished over an average driving range of 5 full fuel tanks providing the tank can be easily replenished (e.g. without the use of tools and without removing vehicle interior trim. The opening of an interior flap, in order to gain access for the purpose of reagent replenishment, shall not be understood as the removal of interior trim). If the tank is not considered to be easy to replenish as described above, the minimum tank capacity shall be at least equivalent to an average driving distance of 15 full fuel tanks. However, in the case that in paragraph 3.5. of this annex, the manufacturer chooses to start the warning system at a distance which may not be less than 2,400 km before the reagent tank becomes empty, the above restrictions on a minimum tank capacity shall not apply.**

1.2. **In the context of this annex, the term "average driving distance" shall be taken to be derived from the fuel or reagent consumption during a type 1 test for the driving distance of a fuel tank and the driving distance of a reagent tank respectively."**

Paragraph 2.1., amend to read:

"2.1. The vehicle shall include a specific indicator on the dashboard that informs the driver ~~of low levels of reagent in the reagent storage tank and of when the reagent tank becomes empty~~ **when reagent levels are below the threshold values specified in paragraph 3.5. of this annex."**

Paragraph 3.1., amend to read:

"3.1. The vehicle shall include a warning system consisting of visual alarms that informs the driver when **an abnormality is detected in the reagent dosing e.g. when emissions are too high,** the reagent level is low, ~~that the tank soon needs to be refilled,~~ **reagent dosing is interrupted** or the reagent is not of a quality specified by the manufacturer. The warning system may also include an audible component to alert the driver."

Paragraph 3.4., amend the last sentence to read:

"3.4. . . . The continuous warning system may be temporarily interrupted by other warning signals providing **that they are** important safety related messages."

Paragraph 3.5., amend to read:

"3.5. The warning system shall activate at a distance equivalent to a driving range of at least 2,400 km in advance of the reagent tank becoming empty, **or at the choice of the manufacturer at the latest when the level of reagent in the tank reaches one of the following levels:**

(a) a level expected to be sufficient for driving 150% of an average driving range with a complete tank of fuel; or

(b) 10% of the capacity of the reagent tank,

whichever occurs earlier."

Paragraph 5.5., amend to read:

"5.5. In the case of interruption in reagent dosing activity the driver warning system as referred to in paragraph 3. shall be activated, which shall display a message indicating an appropriate warning. ~~This activation shall not be required where the interruption is demanded by the Engine Control Unit (ECU)~~ **Where the reagent dosing interruption is initiated by the engine system** because the vehicle operating conditions are such that the vehicle's emission performance does not require reagent dosing, **the activation of the driver warning system as referred to in paragraph 3 may be omitted,** provided that the manufacturer has clearly informed the Type Approval Authority when such operating conditions apply. If the reagent dosing is not rectified within 50 km of the activation of the warning system then the driver inducement requirements of paragraph 8. below shall apply."

Paragraph 6.2., amend the first sub-paragraph to read:

"6.2. The manufacturer shall demonstrate that use of the sensors referred to in paragraph 6.1. above and any other sensors on the vehicle, results in the activation of the driver warning system as referred to in paragraph 3. above, the display of a message indicating an appropriate warning (e.g. "emissions too high - check urea", "emissions too high - check AdBlue", "emissions too high - check reagent"), and the **activation of the** driver inducement system as referred to in paragraph 8.3. below, when the situations referred to in paragraphs 4.2., 5.4. or 5.5. above occur."

In the 06 series of amendments, paragraph 6.2., insert a second sub-paragraph to read:

"For the purposes of this paragraph these situations are presumed to occur if the applicable NOx limit of the table set out in paragraph 5.3.1.4. of this Regulation multiplied by a factor of 1.5 is exceeded. The NOx emissions during the test to demonstrate compliance with these requirements shall be no more than 20 per cent higher than the above threshold."

Paragraph 8.2., amend to read:

"8.2. The inducement system shall activate at the latest when the level of reagent in the tank reaches:

(a) **In the case that the warning system was activated at least 2,400 km before the reagent tank was expected to become empty,** a level ~~equivalent to~~ **expected to be sufficient for driving** the average driving range of the vehicle with a complete tank of fuel.

(b) **In the case that the warning system was activated at the level described in paragraph 3.5.(a), a level expected to be sufficient for driving 75% of the average driving range of the vehicle with a complete tank of fuel; or**

(c) **In the case that the warning system was activated at the level described in paragraph 3.5.(b), 5 per cent of the capacity of the reagent tank.**

(d) **In the case that the warning system was activated ahead of the levels described in both paragraph 3.5.(a) and 3.5.(b), whichever level described in (a) or (b) of this paragraph occurs earlier.**

Where the alternative described in paragraph 6.1. is utilised, the system shall activate when the failures described in paragraphs 4 or 5 or the NOx levels described in paragraph 6.2. have occurred.

~~The system shall also activate when the failures in paragraphs 4., 5., or 6. above have occurred, depending on the NOx monitoring approach.~~ The detection of an empty reagent tank and the ~~failures~~ **irregularities** mentioned in paragraphs 4., 5., or 6. above shall result in the failure information storage requirements of paragraph 7. above **taking** ~~coming into~~ effect."

Paragraph 8.3.1., amend to read:

"8.3.1. A "no engine restart after countdown" approach allows a countdown of restarts or distance remaining once the inducement system activates. Engine starts initiated by the vehicle control system, such as start-stop systems, are not included in this countdown. Engine restarts shall be prevented immediately after:

(a) In the case that the inducement system was activated at least 2400 km before the reagent tank was expected to become empty, the vehicle has travelled a distance expected to be sufficient for driving the average driving range of the vehicle with a complete tank of fuel since the activation of the inducement system, or

(b) In the case that the inducement system was activated at the level described in paragraph 8.2.(b), the vehicle has travelled a distance expected to be sufficient for driving 75 % of the average driving range of the vehicle with a complete tank of fuel since the activation of the inducement system, or

(c) In the case that the inducement system was activated at the level described in paragraph 8.2.(c), the vehicle has travelled a distance expected to be sufficient for driving the average driving range of the vehicle with 5 per cent of the capacity of the reagent tank, since the activation of the inducement system, or

(d) In the case that the inducement system was activated ahead of the levels described in both paragraph 8.2.(b) and 8.2.(c) but less than 2400 km before the reagent tank was expected to become empty, whichever distance described in (b) or (c) of this paragraph is the shorter, or

the reagent tank becomes empty ~~or a distance equivalent to a complete tank of fuel has been exceeded since the activation of the inducement system, whichever occurs~~ **should this occur** earlier."

Paragraph 8.3.4., amend to read:

"8.3.4. A "performance restriction" approach restricts the speed of the vehicle after the inducement system activates. The level of speed limitation shall be noticeable to the driver and significantly reduce the maximum speed of the vehicle. Such limitation shall enter into operation gradually or after an engine restart. Shortly before engine restarts are prevented, the speed of the vehicle shall not exceed 50 km/h. Engine restarts shall be prevented immediately after:

(a) In the case that the inducement system was activated at least 2,400 km before the reagent tank was expected to become empty, the vehicle has travelled a distance expected to be sufficient for

driving the average driving range of the vehicle with a complete tank of fuel since the activation of the inducement system, or

(b) In the case that the inducement system was activated at the level described in paragraph 8.2.(b), the vehicle has travelled a distance expected to be sufficient for driving 75 % of the average driving range of the vehicle with a complete tank of fuel since the activation of the inducement system, or

(c) In the case that the inducement system was activated at the level described in paragraph 8.2.(c), the vehicle has travelled a distance expected to be sufficient for driving the average driving range of the vehicle with 5 per cent of the capacity of the reagent tank, since the activation of the inducement system or

(d) In the case that the inducement system was activated ahead of the levels described in both paragraph 8.2.(b) and 8.2.(c) but less than 2400 km before the reagent tank was expected to become empty, whichever distance described in (b) or (c) of this paragraph is the shorter, or

the reagent tank becomes empty ~~or a distance equivalent to a complete tank of fuel has been exceeded since the activation of inducement system, whichever occurs~~ **should this occur** earlier."

Paragraph 8.4., amend to read:

"8.4. Once the inducement system has **prevented engine restarts** ~~fully activated and disabled the vehicle~~, the inducement system shall only be deactivated if ~~the quantity of reagent added to the vehicle is equivalent to 2,400 km average driving range, or~~ the **irregularities** ~~failures~~ specified in paragraphs 4., 5., or 6. of this appendix have been rectified **or if the quantity of reagent added to the vehicle meets at least one of the following criteria:**

(a) expected to be sufficient for driving 150% of an average driving range with a complete tank of fuel; or

(b) at least 10 per cent of the capacity of the reagent tank;

After a repair has been carried out to correct a fault where the OBD system has been triggered under paragraph 7.2. above, the inducement system may be reinitialised via the OBD serial port (e.g. by a generic scan tool) to enable the vehicle to be restarted for self-diagnosis purposes. The vehicle shall operate for a maximum of 50 km to enable the success of the repair to be validated. The inducement system shall be fully reactivated if the fault persists after this validation."

Delete paragraph 8.6. and renumber paragraphs 8.7. and 8.8. as 8.6. and 8.7.

Paragraph 9.3., amend to read:

"9.3. The instructions shall specify if consumable reagents have to be **replenished** ~~refilled~~ by the vehicle operator between normal maintenance intervals. They shall indicate how the **vehicle operator** ~~driver~~ should **replenish** ~~refill~~ the reagent tank. The information shall also indicate a likely rate of reagent consumption for that type of vehicle and how often it should be replenished."

Paragraph 9.4., amend to read:

"9.4. The instructions shall specify that use of, and **replenishing** ~~refilling~~ of, a required reagent of the correct specifications is mandatory for the vehicle to comply with the certificate of conformity issued for that vehicle type."

Paragraph 10., amend to read:

"10. Operating conditions of the after-treatment system Manufacturers shall ensure that the emission control system retains its emission control function during all ambient conditions, especially at low ambient temperatures. This includes taking measures to prevent the complete freezing of the reagent during parking times of up to 7 days at 258 K (-15 °C) with the reagent tank 50 per cent full. If the reagent ~~has~~ **is** frozen, the manufacturer shall ensure that reagent shall be ~~available~~ **liquefied and ready** for ~~use~~ **correct operation of the emission control system** within 20 minutes **of after** the vehicle ~~starting~~ **was started** at 258 K (-15 °C) measured inside the reagent tank, ~~so as to ensure correct operation of the emission control system~~."

II. Justification

1. The first introduction of reagent-based NOx-aftertreatment required the acceptance of the customer for an additional consumable operating fluid. For this reason, where possible the reagent tank size was designed to require reagent refuelling only at regular service intervals. Therefore, a long-range driver warning to refill AdBlue® was needed to cater for normal servicing intervals, arrange AdBlue®/workshop availability and to plan accordingly. This need is reflected by the current legal requirements which can be summarized as follows.

2. For passenger cars the warning indicator to refill AdBlue® has to be activated at 2,400 km of remaining reagent range. The inducement system, which encourages the customer to refill the reagent tank, has to be activated at least at a fuel-range of one tank. This is equivalent to approximately 800 km.

3. The need for further vehicle weight reduction for CO_2 optimisation and vehicle packaging problems will imply smaller AdBlue® tanks. The wide roll-out of easy AdBlue® refilling (with needed political support to ongoing industry activities) must start happening, at least in regions applying Euro 6 emissions limits. Customers are generally familiar with AdBlue® (but increased communications will be needed as SCR is widely applied) and refilling will be eased by the roll-out of AdBlue® pump nozzles next to diesel pumps – therefore the need for more frequent AdBlue® refilling by the customer can be addressed. Collaboration is needed.

4. Service stations where AdBlue® can be purchased can be found online at least in Europe, for example www.findadblue.com and industry is working on several pilot projects at filling stations for car AdBlue® refilling.

5. With the necessary focus on smaller AdBlue® tanks, the current warning scenario distance of 2,400 km would equal a high percentage of the total reagent tank volume across the diesel car fleet and would result in customers needing to refill the AdBlue® tank at nearly every other refuelling stop.

6. In the United States of America, where larger distances are driven on average compared to Europe, 1,000 miles was fixed by the Environmental Protection Agency (EPA) as the warning scenario limit for AdBlue® in 2007, even without the security of a more widespread AdBlue® refilling infrastructure at that time.

7. For heavy-duty vehicles, the warning has to be activated at least at a reagent level of 10 per cent of total reagent tank volume. The inducement system has to be activated at least at 2.5 per cent of reagent level.

8. Considering the improved AdBlue® refilling infrastructure leading to easier refilling of AdBlue® by customers, increased customer knowledge and acceptance of AdBlue®, the activation of the warning/inducement should be adopted according to these values.

9. The provisions should permit the manufacturer in agreement with the Type Approval Authority to determine the starting point for warning and inducement system activation within reasonable limits for the vehicle type to avoid unsatisfied customers facing frequent and untimely warning messages. The warning and inducement requirements for heavy-duty vehicles provides a reasonable starting point, which should be taken over into the Euro 6 legislation as an option for the manufacturer.